

OBSERVATIONS ON THE CLASSIFICATION OF CERTAIN SCHISTOSOME CERCARIAE

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Since sending our description of the cercaria of *S. haematobium* to press, we have had the opportunity of seeing Khalil's paper on the cercaria of *S. mansoni* and Bettencourt and da Silva's paper on the cercaria of *S. haematobium* in Portugal; Khalil (1922) gives an account of the morphology of the cercaria of *S. mansoni* from *Planorbis boissyi* of Egypt. We find that his description of this cercaria corresponds almost in every detail with our description of the cercaria of *S. haematobium*. He describes, however, four oral glands with four ducts, but he qualifies this by the statement 'distinct outlines of separate glands cannot be made out' and that their duct openings are 'apparently unarmed with papillae.' He also describes two ciliated areas in the beginning and end of the main excretory duct. We referred in our description to our difficulty in making these structures out in the cercaria of *S. haematobium* and we also mentioned the variable accounts of these structures given by different authors. Bettencourt and da Silva (1922) found such areas in two fusiform dilatations in the tubes of the excretory system of the cercaria of *S. haematobium*, but noted that they were not easily observable in all specimens, and as a rule were not visible except when the cercaria was on the point of death. These ciliated areas are evidently so difficult to locate that they do not afford sufficiently reliable information for purposes of classification.

In Khalil's paper, describing the cercaria of *S. mansoni* from *P. boissyi*, the second figure in the text is labelled 'Camera lucida

drawing of *Schistosomum haematobium* cercaria.' This we conclude is a mistake for *S. mansoni*, for the following reasons:—

1. The title of the paper is 'Cercaria of *Schistosomum mansoni*.'
2. The material studied (p. 1) is from *Planorbis boissyi*.
3. The text is entirely a description of *S. mansoni* cercariae.
4. Khalil states (p. 5): 'There is no reliable account of the anatomy of *Schistosomum haematobium* cercariae available.'
5. There is no figure of the general anatomy of the cercaria of *S. mansoni* except this, which is labelled *Schistosomum haematobium*.

Bettencourt and da Silva describe the cercaria of *S. haematobium* as possessing only three pairs of unicellular glands in the posterior region of the body; the cells are of one type, having their protoplasm filled with coarse acidophilic granules. Three ducts lead forward from these and end in the openings. Our description of the cercaria of *S. haematobium* is at variance with that of Bettencourt and da Silva.

A study of this more recent work does not assist us in differentiating the cercaria of *S. haematobium* as described by us from that of *S. mansoni* as described by Khalil, by means of the morphology; further, it does not assist us in distinguishing either of these from *Cercaria indica* XXX described by Sewell. By what means can we distinguish the three human Schistosome cercariae, *japonicum*, *haematobium*, and *mansoni* from each other and from *Cercaria indica* XXX?

MORPHOLOGY. If the secretory glands of *japonicum* are all of one type under all conditions and in all specimens, we have here a character to distinguish it from the other three. The most recent studies on the cercariae of *S. haematobium*, *S. mansoni*, and *C. indica* XXX disclose no constant morphological character nor staining reaction by which they can be distinguished one from the other.

CLASSIFICATION BY MEANS OF THE IMMEDIATE HOST

As our knowledge stands at present, classification of the above four Schistosome cercariae by means of mollusc hosts does not appear possible; but a critical survey of observations on this point is interesting. Observers, however, are somewhat handicapped by the uncertainty and changeable nature of mollusc nomenclature. Annandale (1924) states that hitherto the cercariae of *S. japonicum*

have been found only in molluscs of the genus *Oncomelania*: 'Probably all the living species of the genus are potential carriers of *S. japonicum* but further information is needed on this head.' He states also that there is no evidence that *Blandfordia* is a disease carrier. Up to the present then, the cercaria of *S. japonicum* has only been found in the genus *Oncomelania*—but we do not know whether it will develop in *Planorbis* or *Bullinus*, nor yet whether *mansoni* or *haematobium* will develop in *Oncomelania*. Bettencourt and da Silva describe *haematobium* cercariae from *Planorbis* in Portugal. This observation appears to upset the possibility of classification by snail host. With regard to *S. haematobium* and *S. mansoni*, Leiper (1915) found that: 'In females reared from *Bullinus* the eggs are constantly terminal-spined, even in small young females. . . . In females reared from *Planorbis boissyi*, the eggs are constantly lateral-spined.' The work of Faust, Porter and the Portuguese observers, together with certain facts from India appear to show that classification by snail host is not now reliable; yet it seems remarkable that in Egypt where there are both forms of these human miracidia present and snails of both *Bullinus* and *Planorbis* genera, there has never been reported, so far as we are aware, any deviation from this selective habit. The geographical distribution of the infections does not suggest that the genus *Planorbis* can be generally utilized to propagate *haematobium*.

Before we can definitely state that classification by the snail host must be discarded, it appears to us essential that very complete experimental evidence must be brought forward which will associate clearly the cercariae from any supposed snail host with the adult worm. While the classification of the cercariae belonging to *S. haematobium* or *S. mansoni* appears to us impossible on the grounds of morphology or staining reactions, we are not in a position to state at present whether the snail host will finally help us in this matter.

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